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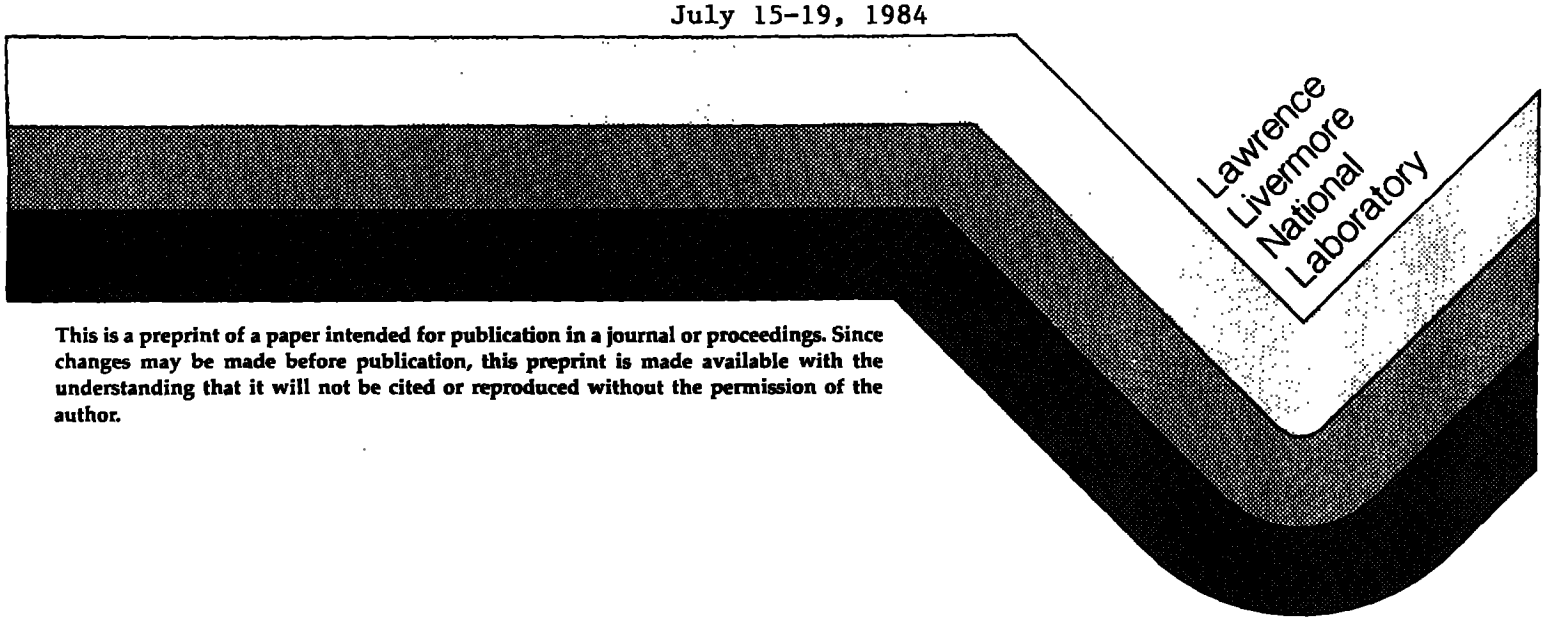

LASER FABRICATION OF INTEGRATED CIRCUITS

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In recent years there have been numerous demonstrations of laser-initiated modification of semiconductor surfaces, each specifically addressing either material etching, deposition, or doping. As these laser-driven processes become better understood and more controllable, they may become quite important in some phases of integrated circuit fabrication. For example, some steps in conventional semiconductor processing may be accelerated using laser techniques. In addition, there may be a significant impact in the semi-custom and custom integrated circuit market.

The two complementary modes of laser device fabrication are direct-laser writing and large area projection printing. Both pyrolytic and photolytic processes, which in some cases can mimic current conventional processing steps, may find use in either mode of operation. In direct-laser writing, a temporally-modulated cw laser, focused to micron dimensions, irradiates the substrate, which is bathed in an appropriate reaction gas mixture; allowance is made for relative lateral translation of the laser and substrate. This mode of operation is resist-free and mask-free. In contrast, with projection printing a high power-pulsed laser irradiates the substrate through a mask, interacting either by developing, and in some cases ablating, resist predeposited on the substrate or, alternately, by stimulating pyrolytic/photolytic reactions at the (resist-free) substrate - reactive gas interface.

A review of recent progress in the fabrication of integrated circuits using these techniques will be presented, along with a discussion of the associated set of necessary laser processing steps and the compatibility of these different laser steps with the overall process.

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